3983-06 May 1992

Geographic Variation in the Volume Intensity of Medicare Physician Services in 1988: A Descriptive Analysis

John Holahan
Stephen Zuckerman

Support for this research was provided by the Health Care Financing Administration to The Urban Institute through Cooperative Agreement No. 17-C-99473/3-01. This cooperative agreement supported a number of research h projects related to the Medicare Volume Performance Standard Policy. The total budget for all of these projects was $449,419 and represents the sole source of funding. Opinions expressed in this document are those of the authors and do not necessarily represent the views of the Health Care Financing Administration, The Urban Institute, or its sponsors.

TABLE OF CONTENTS

I. INTRODUCTION 1

II. VARIABLE DEFINITIONS AND METHODS 3
    Indices Defined 3
        Laspeyres Index 3
        Paasche Index 4
        Fisher's Ideal Index 4
    Areas Defined 5
    Type-of-Service Defined 8
    Methods 8

III. RESULTS 11
    Variations in Allowed Charges 11
    Variations in Volume and Intensity 13
    Utilization in Selected High and Low Volume and Intensity Areas 16
    Variations in Allowed Charges, Prices, and Volume and Intensity by
        Type of Area and Region 20
        Evaluation and Management Services 27
        Procedures 29
        Imaging and Tests 30

IV. CONCLUSIONS 32

REFERENCES 35

APPENDIX . . . .

LIST OF TABLES

Table

1 Designation of Medicare Payment Localities 7

2 Type of Service Classification System 9

3 Area Variation in Medicare Allowed Charges Per Enrollee, by Type of Service, 1988 12

4 Area Variations in Medicare Volume/Intensity Per Enrollee, by Type of Service, 1988 14

5 What Types of Service Exhibit the Most Variations? Volume and Intensity per Beneficiary in Absolute Dollars 17

6 What Types of Service Exhibit the Most Variations? Volume and Intensity per Beneficiary Relative to the National Average 18

7 Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity -- All Physician Services, 1988 21

8 Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity -- Summary of Results, Evaluation and Managment Services, 1988 23

9 Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity -- Procedures, 1988 24

10 Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity -- Imaging and Tests, 1988 25

I. INTRODUCTION

Geographic variation in health service utilization has become a major issue for research as well as for policymakers. Evidence on variations across small areas produced by Wennberg and others has resulted in a major effort to analyze the appropriateness of a wide range of health care services (Wennberg and Gittelsohn, 1982; Roos and Roos, 1982; McPherson et al., 1982; Moore, 1985). One focus of such research has been on identifying the amount of inappropriate care (Chassin et al., 1987), with the goal of ultimately improving the quality of health services available to individuals in the United States and elsewhere. The issue of area variations has a larger policy context as well. Variations in utilization rates implies that some individuals may use too few services while others may use too many. Low levels of utilization may indicate problems of access to necessary physician services. High levels of use may imply over-utilization; such patterns may be tied to excessive Medicare expenditures, a major problem in a time of fiscal stress in government programs.

The issue of wide variations in Medicare utilization also has been recognized in the Physician Payment Reform (PPR) initiative, legislated in the 1989 Omnibus Budget Reconciliation Act (OBRA 89). That legislation called for the adoption by Medicare of a relative value scale, with geographic adjustments to Medicare fees reflecting costs of practice, beneficiary protection by limiting charges, and Medicare volume performance standards (MVPS), which place limits on the rate of growth in Medicare fees. The geographic adjustments to fees and the MVPS provisions of the PPR directly and indirectly address issues of geographic variations in access and over-utilization. The geographic adjustments to the Medicare fees through the Geographic Practice Costs Index (GPCI), generally will have the direct effect of increasing fees, relative to pre-PPR levels, in rural areas and reducing them in urban areas. One PPR goal is to increase access in the former.

The Medicare volume performance standard policy (MVPS) will tie the future updates in physician fees to the rate of growth in the volume and intensity of physician services. As the MVPS policy has been implemented, it will treat all geographic areas the same, regardless of whether areas have high or low *levels* of utilization. The MVPS is required, however, to take into consideration evidence of problems of access and over-utilization, but it is not specified how this is to be done. Possible refinements of the MVPS to include subnational volume performance standards might directly address problems of access and over-utilization. A subnational MVPS might distinguish between areas with low levels of utilization by recommending higher standards than for areas with historically high levels of utilization.

This paper presents a comprehensive description of the extent of cross-sectional geographic variation in Medicare physician service use rates across all services and across the entire country. We use 1988 data from the Part B Medicare Annual Data (BMAD) system to derive a measure of volume and intensity that captures differences in use rates across all services, and that can be disaggregated by type-of-service (see Berenson and Holahan, 1990). These indices represent a major improvement over earlier studies that focused on a limited number of procedures (e.g., Holahan, Berenson, and Kachavos, 1990) and/or a small set of geographic areas (e.g., Stano, 1986). In general, data or methods that would allow for a comprehensive assessment of this issue has not been available to earlier researchers.

II. VARIABLE DEFINITIONS AND METHODS

This paper uses the 1988 BMAD 5 percent sample of Medicare beneficiaries to decompose area variations in expenditures per enrollee into the component due to price and that due to volume and intensity. Because volume and intensity differences cannot be observed directly, they are measured as the variation in expenditures that remains after price differences have been netted out. This is an improvement over Chassin et al. (1987) that relied on actual service counts - a less comprehensive measure than volume and intensity. In order to measure volume and intensity, we develop price indices that can be used to deflate Medicare physician expenditures (allowed charges) that take into consideration the differences in service mix across areas. Areas are defined as aggregations of the 240 pre-PPR Medicare pricing localities that reflect fundamental differences in community types (discussed below).

Indices Defined

Laspeyres Index. The most straightforward approach to the price index would base it on the prices of a nationally-representative basket of Medicare services in each area of the country (a Laspeyres form). However, not all services that are important in aggregate spending data are provided in each area of the country. Therefore, it is not possible to price the representative market basket in each area. Second, since the relative importance of each service varies from area to area, differences in expenditures deflated by the price index reflect service mix as well as volume and intensity differences. Service mix may vary because of geographic variation in relative prices, which is extensive (Escarce, 1990). Preliminary analysis of the data suggests that service mix varies much more cross-sectionally than it does over time, making it essential to address service mix as well as volume in this paper.

Standard economic theory suggests that an area will reduce the consumption of its relatively high-priced services and expand the low-priced services. This would lead to less cross-sectional variation in the weights for high-priced than for low priced services, if computed separately for each area. This substitution bias issue would suggest that, for most goods and services, a cross-sectional Laspeyres index would overstate true price differences. If prices differentials were overstated, then volume and intensity variation would be understated. However, in the case of physician services, it appears that area-level weights for high-priced services vary more than those low-cost services. Possibly, this is due to the fact that new technologies tend to have higher prices and are introduced at differential rates across areas. This means that a Laspeyres index that relied on national weights would tend to understate price differentials and overstate variation in volume and intensity.

Paasche Index. Using a Paasche index in which the weights were different for each area would of course resolve the problem that some services that are important overall are not produced in every area. A Paasche form of the index would provide information on the prices of the area's market basket of services if it were purchased at the national average allowed charges. However, there would be no link to the national average importance of each service as there is in a Laspeyres index. Given the greater extent of geographic variation in the relative importance of high-priced services, the Paasche would lead to understatement of price variation and overstatement of volume and intensity differences, the reverse of the Laspeyres problem.

Fisher's Ideal Index. This reasoning leads us to prefer the Fisher's Ideal index, as discussed in Zuckerman and Holahan (1991). The index is formed as the product of a Laspeyres index that uses national weights for the services produced in a given area and a Paasche index that uses area-specific weights. An important point to keep in mind in thinking about this index is that the services included in the computation for a particular area may differ from those included in another area. The resulting price index will measure the difference in prices between the area and the nation for those services purchased in the area. (One should not try to compare indices between areas, as comparisons are only valid between an area and the national average.) The cross-sectional Fisher's Ideal will be computed for each type of service and for all services. The Fisher's Ideal price indices for each area for all services are presented in the Appendix.

The price indices are then applied to data on allowed charges from the BMAD beneficiary file to create measures of volume and intensity for each geographic area. Individuals on the beneficiary file may use services in their own locality as well as any other locality in the country. To deflate allowed charges on the beneficiary file for individuals living in a given area by price indices, for services produced in that same area, will lead to biased measures of volume and intensity. It is necessary to deflate allowed charges for services used in each area by the appropriate price index for that area. This involves aggregating allowed charges for beneficiaries for each area in which services are received. We then deflate by the appropriate price index and finally, sum across all areas to create measures of real expenditures based on the area in which individuals reside. In this way we have the measure of volume and intensity of services used by beneficiaries in each area.

Areas Defined

The 121 geographic areas that serve as the basis of this study are aggregations of the 240 pre-PPR Medicare pricing localities and can represent broad categories of areas. Specifically, we identify sets of localities that represent very large cities, large cities adjacent to very large cities, other large cities, small cities, rural areas and small cities, rural areas, and states. This is the same area classification scheme used in Holahan and Zuckerman (1991). Table 1 indicates the cities or the geographic areas that are within each type of area. Very large cities include the ten largest MSAs in terms of population. Since our designation of cities is constrained by the definition of Medicare localities, in some instances we were forced to group cities with surrounding areas to approximate an MSA. For example, in San Francisco we have included San Mateo and Marin counties. Washington, D.C. includes adjacent counties in Maryland and Northern Virginia. Large Pennsylvania cities include Pittsburgh, Philadelphia and Scranton.

Large cities adjacent to very large cities is a group of cities with more than 100,000 Medicare enrollees contiguous to one of the ten largest MSAs. For example, Oakland/Berkeley is adjacent to San Francisco and San Bernadino/Riverside is adjacent to Los Angeles. Non-adjacent large cities are similarly sized cities, in terms of Medicare enrollment, that are not contiguous to a very large MSA. These include Birmingham, Alabama; New Orleans, Louisiana; Baltimore, Maryland; Dallas, Texas, and others.

Small cities include MSAs with less than 100,000 Medicare enrollees. These include Mobile, Alabama; Stockton and Bakersfield, California; Iowa City, Iowa; Tucson, Arizona and Tulsa, Oklahoma. Small cities and rural areas includes both small MSAs and rural areas where it was impossible because of the Medicare locality structure to separate the small city from the rural area. Rural areas could be defined in 11 states and are entirely rural, in that they contain no counties that are part of an MSA. Most of the 22 states that could not be subdivided are small states, but some are not, e.g., North Carolina, New Jersey, Tennessee, and Colorado.

Table 1

Designation of Medicare Payment Localities[1]

VERY LARGE CITIES

San Francisco, Cal metro area
Washington, DC metro area
Miami, Fla
Chicago, Ill
Urban Mass
Detroit, Mich
NYC metro area
Large cities, Penn
Houston, Tex
Los Angeles, Cal

ADJACENT LARGE CITIES

Oakland/Berkeley, Cal
San Bernadino/Riverside, Cal
Fort Lauderdale, Fla
East St. Louis, Ill
Poughkpsie/North NYC suburbs
Ventura, Cal
Anaheim/Santa Ana, Cal

NONADJACENT LARGE CITIES

Birmingham, Ala
New Orleans, La
Sacremento, Cal
Santa Clara/Monterey, Cal
North and North Central Fla
Indiana metro areas
Kansas City metro area
Buffalo, NY
Rochester, NY
San Antonio, Tex
Dallas, Tex
Seattle, Wash
Milwaukee, Wisc
Phoenix, Ariz
Atlanta, Ga
Portland, Ore
San Diego, Cal
Hartford, Conn
New Haven, Conn
St. Paul/Minneapolis, Minn
Tidewater, Va
St. Louis, Mo
Akron/Youngstown, Ohio
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dayton/Springfield, Ohio
Baltimore, MD

SMALL CITIES

Small cities, Ala
Mobile, Ala
Small cities, La
Stockton, Cal
Merced, Cal
Fresno, Cal
Monterey, Cal
Bakersfield, Cal
Small cities, Ill
Small cities, Ind
Iowa City, Iowa
Omaha, Neb
Lexington/Louisville, Ky
N. Central cities, NY
Small cities, Penn
Fort Worth, Tex
Tucson, Ariz
Small cities, Ga
Oklahoma City, Ok
Tulsa, Ok
Santa Barbara, Cal
Stamford, Conn
Richmond, Va
Charleston, Wv

SMALL CITIES/RURAL

Small cities/rural Iowa
Small cities/rural Kan
Small cities/rural Neb
Small cities/rural Ky
Small cities/rural Mass
Small cities/rural Mich
Small cities/rural Minn
Northeast Tex
Southeast Tex
Western Tex
Small cities/rural Wash
Small cities/rural Wisc
Small cities/rural Ore
Small cities/rural Conn
Small cities/rural Va
Small cities/rural Mo
Small cities/rural Ohio
Small cities/rural WV
Small cities/rural MD

RURAL

Rural Ala
Rural La
Northern Rural Cal
Rural Fla
Rural Ill
Rural Ind
Rural NY
Rural Penn
Rural Ariz
Rural Ga
Rural Ok

STATEWIDE

Arkansas
Colorado
Delaware
Montana
New Hampshire
Vermont
North Dakota
South Dakota
New Jersey
Rhode Island
South Carolina
Utah
Alaska
Hawaii
Nevada
New Mexico
Idaho
Tennessee
Wyoming
North Carolina
Mississippi
Maine

---

[1] Areas are 121 aggregations of 240 Medicare Carrier Pricing localities.

Source: Urban Institute, Health Policy Center

Type-of-Service Defined

In addition to analyzing overall variation in volume and intensity, we consider differences by types of services, as defined in the new procedure classification system for Medicare services developed as part of this project by the Urban Institute (see Berenson and Holahan, 1990). This type of service classification system divides Medicare services into 4 major categories and 20 subcategories. Table 2 provides data on Medicare expenditures using this classification system. The first major group is evaluation and management services; it includes office visits, hospital visits, emergency room services, home and nursing home visits, consultations, and specialist evaluation and management services. Specialist evaluation and management services includes a range of evaluation and management services provided by ophthalmologists, psychiatrists, pathologists, allergists, and other subspecialties.

The second major group is procedures. This includes major procedures, subdivided into cardiovascular, orthopedic, and other, ambulatory procedures which, subdivided into eye and other, and minor procedures,including endoscopies and oncology procedures. Imaging is the third major group and is divided into standard imaging (routine x-rays and nuclear medicine), advanced imaging (CT scans and magnetic resonance imaging), sonographic imaging, and imaging/procedures (largely cardiac catheterization). The final major group is tests, divided into laboratory and other tests. Other tests is dominated by a wide range of cardiovascular tests.

Methods

The methods followed in this paper are intended to describe the extent of cross-sectional geographic variation in expenditures, price, and volume and intensity at a single point in time. While explaining the reasons for the observed variations would be useful, it is beyond the scope of this report. We use both tabular analysis and descriptive regressions to document the

Table 2

Type of Service Classification System
(Numbers of Procedure Codes, Allowed Charges, 1988)

	HCPCS Codes	Allowed Charges (in millions)	% of All Allowed Charges
Evaluation and Management Services (M)			
Office Visits	54	$3,151.7	11.64%
Hospital Visits	39	3,105.5	11.47%
Emergency Room Services	21	327.9	1.21%
Nursing Home and Home	94	364.3	1.35%
Specialty Specific Eval. & Mgmt. Serv.	221	1,254.0	4.63%
Consultations	21	929.2	3.43%
Procedures (P)			
Major Procedures			
Cardiovascular	474	1,475.6	5.45%
Orthopedic	647	853.4	3.15%
Other	1400	1,609.3	5.94%
Ambulatory Procedures			
Eye	208	2,386.7	8.82%
Other	1270	942.5	3.48%
Minor Procedures	992	821.2	3.03%
Oncology Services	171	454.8	1.68%
Endoscopy Procedures	380	1,228.8	4.54%
Dialysis Services	53	233.7	0.86%
Imaging Procedures (I)			
Standard Imaging	1001	1,582.9	5.85%
Advanced Imaging	141	715.0	2.64%
Sonography	96	689.9	2.55%
Imaging/Procedure	259	512.0	1.89%
Tests (T)			
Lab Tests	1510	1,425.8	5.27%
Other Tests	524	1,188.7	4.39%
Anesthesiology (A)		1,126.7	4.16%
Other (O)			
A-V HCPCS Codes (except M,P,R)		468.8	1.73%
W-Z Local Codes		66.9	0.25%
Other Unassigned		159.5	0.59%
	9,576	$27,074.8	100.00%

SOURCE: Tabulations from the 1988 BMAD 100% procedure file.

jh.3900:3983-06 t2

geographic variation. The tables include measures of mean physician expenditures (allowed charges) and coefficients of variation as well as the ratio of the 95th to 5th percentiles. The 95th and 5th percentiles were chosen to eliminate possible outliers. In general, we did not believe that the minimum and maximum allowed charges for all services or for any type of service contained obvious errors. Nonetheless, to be conservative, we have eliminated the tails of the distribution, thus presenting a conservative measure of variations across areas in Medicare expenditures. We also present tables that show volume and intensity differences for a selected set of above and below average geographic areas.

Descriptive regressions were estimated for all services and for each type of services in order to explore any systematic variation that existed across types of areas and the four Census regions. The types of areas were large cities, large adjacent cities, large nonadjacent cities, small cities, small cities/rural, rural, and statewide areas; the excluded area in the regressions is small cities. In addition, four Census region variables--east, north central, south, and west--were included; the excluded region in the regressions was the north central. Therefore, the type of area results compare levels of allowed charges, prices, and volume and intensity for each area to that of small cities, while the regional variables compare levels of allowed charges, prices, and volume and intensity to the north central region.

These types of regressions describe the variations but do not explain them. A full model to explain variations across areas would need to include demographic characteristics such as age, sex, race, and health status, as well as income. It would also need to include measures of the availability of physicians (particularly specialists), access to teaching hospitals, the presence in the area of HMOs, and the impact of the risk of malpractice claims. Though not a full model, the regression estimates presented here are a useful way of describing the variations in Medicare spending and in utilization patterns by Medicare beneficiaries.

III. RESULTS

Variations in Allowed Charges

Table 3 presents information on variations across each of the 121 areas in Medicare allowed charges per enrollee for 1988. Data on all services as well as each type of service is presented. The first finding of interest is that the variation as indicated by either the coefficient of variation or the ratio of the 95th to 5th percentiles tends to be lower for all services aggregated together than for most of the individual types of services. This can only be associated with differences in the relative importance of different types of services across geographic areas.

In general, the variations across areas in allowed charges per enrollee were lowest for major orthopedic, cardiovascular, and general procedures. Variations for ambulatory eye and other ambulatory procedures were also relatively low. Variations across areas in allowed charges per enrollee were highest for home and nursing home visits, specialist evaluation and management services, consultations, minor procedures, sonography, oncology, and other tests. The ratio of the 95th to 5th percentiles indicated approximately four-fold variation across areas in allowed charges for these services, indicating widespread differences in the amount the Medicare program spends on its beneficiaries across geographic areas.

The final two columns decompose the variation in allowed charges into the amount that can be associated with price differences and a residual. Across all services, 36.4 percent of the variation was due to price; the remainder, or 63.6 percent, was due to variation in volume and

Table 3

Area Variation in Medicare Allowed Charges Per Enrollee, by Type of Service, 1988

	Mean	C.V.	95th Percentile	5th Percentile	Ratio of 95th to 5th Percentile	Percent of Variation Due to Price Differences	Percent of Variation Due to VI Differences
All Services	$790.43	.27	$1189.54	$548.67	2.2	36.4%	63.6%
Office Visits	99.38	.36	175.18	63.88	2.7	44.0	56.0
Hospital Visits	91.70	.33	142.68	55.07	2.6	22.4	77.6
Emergency Room Services	10.83	.36	17.68	4.55	3.9	15.4	84.7
Non-Hospital, Non-Specialist Visits	10.44	.48	20.35	4.90	4.2	24.8	75.2
Specialist Evaluation & Management Services	37.77	.40	66.75	22.10	3.0	28.0	72.0
Consultations	26.64	.54	47.78	13.56	3.5	26.2	73.8
Major Procedures							
– Orthopedic	27.32	.23	38.54	17.99	2.1	9.6	90.4
– Cardiovascular	47.19	.29	76.21	28.79	2.6	24.1	75.9
– Other	50.91	.22	74.79	35.18	2.1	33.5	66.5
Ambulatory – Eye	75.01	.31	120.58	45.93	2.6	20.6	79.4
Ambulatory – Other	28.75	.32	50.74	17.73	2.7	31.9	68.1
Minor Procedures	23.93	.59	46.91	11.73	4.0	24.8	75.2
Endoscopy	36.41	.30	55.48	19.64	2.8	19.9	80.1
Oncology	14.83	.42	25.47	6.69	3.6	32.3	67.7
Standard Imaging	50.41	.28	78.38	32.94	2.4	19.6	80.4
Advanced Imaging	22.14	.36	39.86	12.82	3.1	22.4	77.6
Sonography	20.26	.46	34.69	9.24	3.8	32.8	67.2
Imaging Procedures	16.55	.30	24.49	9.61	2.5	8.1	91.9
Laboratory Tests	44.03	.35	71.40	26.61	2.7	8.3	91.7
Other Tests	34.26	.45	65.55	16.46	4.0	28.2	71.8

Source: 1988 BMAD 5% Beneficiary File

intensity. This suggests that any reductions in price variation that result from the implementation of the Medicare Fee Schedule will not reduce variations in expenditures to a great extent.

This decomposition was also performed for each individual type of service. The proportion due to price will reflect both the extent of price variation as well as the variation in volume and intensity. For example, a finding that a high proportion of the variation in allowed charges per enrollee is due to price can either be due to the fact that there is extensive price variation or that there is relatively little variation in volume and intensity. Similarly, a finding that a low percentage of the variation is attributable to price differences could reflect either little variation in price or extensive variation in volume and intensity.

Examining individual types of services, we found that prices never explained more than 44 percent of the variation in physician allowed charges (office visits). Over 30 percent of the variation in allowed charges per enrollee for ambulatory, major procedures/other, oncology, and sonography was associated with price variation. On the other hand, price variation is relatively unimportant in explaining variation in physician allowed charges for emergency room care, orthopedic procedures, imaging/procedures, and laboratory services.

Variations in Volume and Intensity

Table 4 presents similar information on variation in the volume and intensity of Medicare physician services.[1] The coefficients of variation and the ratio of the 95th to 5th percentile were .17 and 1.7, respectively, somewhat lower than in Table 3. Again, these are conservative measures of variation across areas. For example, the variation in volume and intensity (V/I) for all services, from the highest to the lowest, was 3.5. Clearly, excluding the tail of the distribution makes a substantial difference in the measure of area variations.

---

[1] Fisher's Ideal price indices for each area are presented in Appendix A.

Table 4

Area Variations in Medicare Volume/Intensity Per Enrollee, by Type of Service, 1988

	Average Volume/Intensity per Enrollee	C.V.	95th Percentile	5th Percentile	Ratio of 95th to 5th Percentile
All Services	77.97	.17	$1014.48	$612.46	1.7
Office Visits	98.42	.21	133.76	73.32	1.8
Hospital Visits	90.91	.26	129.16	57.90	2.2
Emergency Room Services	10.52	.32	16.11	4.88	3.3
Non-Hospital, Non-Specialist Visits	10.32	.36	17.36	4.48	3.9
Specialist Evaluation & Management Services	37.40	.29	56.49	25.57	2.2
Consultations	27.04	.39	46.47	15.73	3.1
Major Procedures					
- Orthopedic	27.43	.21	37.93	18.71	2.0
- Cardiovascular	46.86	.22	64.36	31.27	2.1
- Other	50.52	.15	62.77	37.57	1.7
Ambulatory - Eye	75.37	.24	109.30	51.67	2.1
Ambulatory - Other	28.32	.22	39.33	19.68	2.0
Minor Procedures	23.79	.44	39.37	13.08	3.0
Endoscopy	36.91	.24	52.36	19.30	2.7
Oncology	13.56	.31	22.28	8.13	2.7
Standard Imaging	50.49	.23	71.82	36.01	2.0
Advanced Imaging	22.22	.27	33.02	14.26	2.3
Sonography	20.61	.31	32.26	12.27	2.6
Imaging Procedures	16.52	.28	24.22	8.96	2.7
Laboratory Tests	41.69	.33	67.41	23.52	2.9
Other Tests	34.30	.32	56.32	19.43	2.9

Note: Volume/Intensity per Enrollee is calculated by dividing allowed charges per enrollee by the Fishers Ideal price index, as defined in the text.

Source: 1988 BMAD 5% Beneficiary File

jh.3900:3983-06 t4

Once again, in most cases the variation for all services was less than the variation for most individual services. There is substantial difference across individual types of services in the extent of variation. Those with very high variation, measured as those with coefficients of variation greater than .35, were home and nursing home visits, consultations, and minor procedures. The V/I variation in home and nursing home visits probably reflects widespread area variations in the availability of nursing home care and home visits. The V/I variation in consultations probably reflects differences across areas in access to medical and surgical sub-specialists. The V/I variation in minor procedures primarily reflects differences in the use of dermatological procedures.

Other types of services with high V/I variation (CVs greater than .30) include emergency room services, oncology procedures, sonography, laboratory services, and other tests. The variation in emergency room services probably reflects differences across areas in the importance of the emergency room as a provider of basic medical care services. The high variation in oncology procedures could reflect either possible over-utilization or, conversely, problems of access to these services for individuals living in some parts of the country. The large variation in sonography, laboratory services, and other tests suggests widespread differences in utilization of some procedures and tests by Medicare beneficiaries.

Services with low V/I variation, defined as coefficients of variation less than .3, include hospital visits, specialist evaluation and management services, imaging/procedures, ambulatory procedures/other, and advanced imaging. Types of service with very low V/I variation, as indicated by coefficients of variation of less than .25, include office visits, major orthopedic, cardiovascular, and general procedures, endoscopies, and standard imaging. Thus, several evaluation and management services, procedures and diagnostic services exhibit relatively low variation across geographic areas. Whether the amount of this variation is sufficiently low to relieve concerns about under- and over-utilization is beyond the scope of this study.

Utilization in Selected High and Low Volume and Intensity Areas

To put the volume and intensity issue in more concrete terms, we examined selected areas with very high and very low rates of volume and intensity. The major issue is to identify for which services the high volume and intensity areas most differed from the national average. Similarly, for which services did the low volume and intensity areas most differ from the national average. We have selected three of the areas with very high levels of volume and intensity: Miami, Florida; Los Angeles, California; and Detroit, Michigan. In addition, we have included three areas with very low levels of volume and intensity: small cities/rural Nebraska; Wyoming; and Iowa City, Iowa. These results are presented in Tables 5 and 6. Table 5 presents data on volume and intensity stated in dollars (allowed charges deflated by Fisher's Ideal Price Index). Table 6 presents the same information standardized for the nation with the national average equal to 1.00.

In comparing these six areas to the national average, the findings in general conform to the patterns described earlier. There are significant variations in some evaluation and management services, e.g., office visits, specialist evaluation and management services, and consultations. For example, Miami has measures of volume and intensity for office visits that are 86 percent above the national average, and Los Angeles 62 percent above the national average. In contrast, small cities/rural Nebraska; Wyoming; and Iowa City, Iowa are 83 percent, 78 percent, and 80 percent, respectively, of the national average. Specialist evaluation and management services and consultations also exhibit broad variations. The three cities with high

Table 5

What Types of Service Exhibit the Most Variation?
Volume and Intensity per Beneficiary in Absolute Dollars

	High Volume/Intensity Areas			Low Volume/Intensity Areas		
Procedures	Miami, Florida	Los Angeles, California	Detroit, Michigan	Small Cities/Rural Nebraska	Wyoming	Iowa City, Iowa
All Services	$1380.14	$1080.55	$1177.00	$635.50	$620.47	$577.95
Office Visits	189.52	165.42	133.17	84.22	79.51	81.12
Hospital Visits	162.74	126.26	123.73	74.97	71.43	67.25
Emergency Room Services	13.60	11.37	15.78	5.06	8.15	7.20
Non-Hospital, Non-Specialist Visits	17.52	17.31	15.81	6.31	7.43	9.05
Specialist Evaluation & Management Services	92.78	51.97	56.51	31.39	27.19	33.87
Consultations	78.45	75.92	51.17	15.62	15.70	19.29
Major Procedures						
- Orthopedic	26.18	21.94	23.61	33.73	21.98	20.30
- Cardiovascular	54.69	62.09	58.09	41.01	36.53	22.41
- Other	55.59	56.08	54.72	47.74	53.75	36.99
Ambulatory - Eye	90.58	95.86	95.01	71.40	60.23	55.87
Ambulatory - Other	38.63	38.66	30.62	27.84	34.37	23.87
Minor Procedures	88.50	31.34	67.77	18.73	18.49	19.80
Endoscopy	53.01	43.50	53.54	30.92	31.51	30.08
Oncology	16.62	18.85	25.47	10.94	10.99	7.18
Standard Imaging	100.91	63.88	95.75	33.62	39.38	39.32
Advanced Imaging	45.63	29.84	25.20	11.12	17.23	17.81
Sonography	55.68	20.57	46.33	12.89	12.07	16.32
Imaging Procedures	16.09	18.65	24.25	11.59	11.12	10.67
Laboratory Tests	84.40	70.18	93.36	36.46	28.79	34.54
Other Tests	86.86	50.37	88.89	18.17	18.63	23.36

Source: 1988 BMAD 5% Beneficiary file

Table 6

What Types of Service Exhibit the Most Variation?
Volume and Intensity per Beneficiary Relative to the National Average

	High Volume/Intensity Areas			Low Volume/Intensity Areas		
Procedures	Miami, Florida	Los Angeles, California	Detroit, Michigan	Small Cities/Rural Nebraska	Wyoming	Iowa City, Iowa
All Services	1.68	1.31	1.43	0.77	0.75	0.70
Office Visits	1.86	1.62	1.31	0.83	0.78	0.80
Hospital Visits	1.66	1.29	1.26	0.76	0.73	0.69
Emergency Room Services	1.29	1.08	1.49	0.48	0.77	0.68
Non-Hospital, Non-Specialist Visits	1.51	1.49	1.36	0.54	0.64	0.78
Specialist Evaluation & Management Services	2.32	1.30	1.41	0.79	0.68	0.85
Consultations	2.68	2.60	1.75	0.53	0.54	0.66
Major Procedures						
- Orthopedic	0.98	0.82	0.88	1.26	0.82	0.76
- Cardiovascular	1.16	1.31	1.23	0.87	0.77	0.47
- Other	1.07	1.08	1.06	0.92	1.04	0.71
Ambulatory - Eye	1.18	1.25	1.24	0.93	0.79	0.73
Ambulatory - Other	1.30	1.31	1.03	0.94	1.16	0.81
Minor Procedures	3.36	1.19	2.57	0.71	0.70	0.75
Endoscopy	1.38	1.13	1.39	0.80	0.82	0.78
Oncology	1.12	1.27	1.72	0.74	0.74	0.49
Standard Imaging	1.95	1.24	1.85	0.65	0.76	0.76
Advanced Imaging	1.97	1.29	1.09	0.48	0.74	0.77
Sonography	2.50	0.92	2.08	0.58	0.54	0.73
Imaging Procedures	0.95	1.11	1.44	0.69	0.66	0.63
Laboratory Tests	1.81	1.51	2.00	0.78	0.62	0.74
Other Tests	2.31	1.34	2.37	0.48	0.50	0.62

Note: Each figure in this table represents indices of the area's volume and intensity relative to the national average.

Source: Urban Institute, Health Policy Center

levels of volume and intensity (Miami, Los Angeles, and Detroit)are 132, 30, and 41 percent above the national average, respectively. The three areas with the lowest levels of utilization are 79, 68, and 85 percent of the national average. Consultations vary even more. Miami, Los Angeles, and Detroit are 168, 160, and 75 percent above the average. In contrast, small cities/rural Nebraska; Wyoming; and Iowa City, Iowa are 53, 54, and 66 percent of the national average.

While these six areas represent the extremes for the nation across all services, there is still relatively little variation among them for major procedures. Major general procedures, for example, in all six areas are relatively close to the national average (an exception being Iowa City, Iowa which is only 71 percent of the national average). A somewhat similar pattern is seen for major orthopedic procedures. Major cardiovascular procedures and ambulatory eye procedures show some variation, though substantially less for the evaluation and management services discussed above. Minor procedures (primarily dermatological procedures, as noted earlier) exhibit very large variations across these areas.

Perhaps the types of service in which the high and low volume and intensity areas are most different is in imaging and tests. Miami, Detroit, and Los Angeles have rates of volume and intensity for standard imaging which are 95, 85, and 24 percent above the national average. Small cities/rural Nebraska, Wyoming, and Iowa City are 65, 76, and 76 percent of the national average. Miami and Detroit also have very high rates of utilization of sonographic imaging. The volume and intensity of sonographic imaging in Miami and Detroit are 150 and 108 percent above the national average. In contrast to the high rates in Miami and Detroit, small cities/rural Nebraska, Wyoming, and Iowa City have rates of utilization which are 58, 54, and 73 percent of the national average.

Laboratory and other tests also exhibit very large variations between the high and low utilization areas. Miami, Los Angeles, and Detroit are 81, 51, and 100 percent above the national average. Small cities/rural Nebraska, Wyoming, and Iowa City are 78, 62, and 74 percent below the national average. Finally, other tests, which consist primarily of an array of cardiovascular tests, also show extraordinary variation. Miami and Detroit are 131 and 137 percent above the national average respectively, while small cities/rural Nebraska and Wyoming are about half of the national average.

Variations in Allowed Charges, Prices, and Volume and Intensity by Type of Area and Region

In this section we summarize results of regression analyses that examine the differentials in Medicare allowed charges, prices, and volume and intensity relative to the national average for types of geographic areas and regions. The results for all physician services are presented in Table 7. The major findings are that Medicare allowed charges and volume and intensity were significantly higher in very large and large adjacent cities and significantly lower in the small cities/rural and statewide areas.[2] Medicare allowed charges per enrollee were 41 percent and 30 percent higher in very large and large adjacent cities than in small cities. The higher level of allowed charges in these areas was associated with both higher prices and volume and intensity. The 11 percent lower levels of allowed charges in small cities/rural areas are associated almost entirely with lower levels of volume and intensity. The 18 percent lower levels of spending in statewide areas are associated with both price and volume and intensity differences.

---

[2] Strictly speaking, all of the comparisons of price and volume and intensity between types of areas and regions should be expressed as variations in the size of differentials relative to the national average. For example, because "small cities" is the omitted group in the regression, we should report that the differential in volume and intensity charges between large cities and the nation exceeds the differential in volume and intensity for small cities. The reason for this is that the Fisher's Ideal index does not allow for valid comparison between areas, only relative to the national average. However, for ease of exposition, we have eliminated constant references to "differentials relative to the national average."

Table 7

Variations Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity
All Physician Services, 1988
(t-statistics in parentheses)

	Intercept	Very Large Cities	Large Adjacent Cities	Large Non-Adj Cities	Small Cities/ Rural	Rural	Statewide	East	South	West	R-Squared
Allowed Charges	.87** (15.49)	.41** (5.28)	.30** (3.36)	.05 (.80)	-.11* (1.73)	-.07 (-.91)	-.18** (-2.90)	.08 (1.31)	.16** (3.11)	.22** (4.08)	.43
Price Indices	.92** (41.05)	.16** (5.12)	.12** (3.27)	.02 (1.09)	-.03 (-1.08)	-.04 (-1.41)	-.08** (-3.10)	.09** (3.62)	.05** (2.60)	.17** (7.57)	.53
Volume/ Intensity	.95** (23.38)	.21** (3.80)	.15** (2.41)	.02 (0.55)	-.09* (-1.89)	-.02 (-0.46)	-.10** (-2.36)	0.00 (0.00)	.11** (2.91)	.06 (1.46)	.28

Note: Results significant at the .05 level are indicated by two asterisks. Results significant at the .10 level are indicated by one asterisk.

Source: Urban Institute, Health Policy Center

jh.3900:3983-06 t7

Large nonadjacent cities and rural areas did not have statistically significant differences in allowed charges, prices, or volume and intensity from that in small cities. These results suggest that beneficiaries living in small cities have access to physician services that is comparable to that of those living in many larger cities. The rural results also suggest comparable access. This result is due, in part, to the fact that this "rural" group includes rural areas in otherwise large, industrialized states. These include New York, California, Illinois, Indiana, Pennsylvania, and Florida. Thus, while these beneficiaries live in rural areas, they are often not far from urban centers. In contrast, individuals in the small cities/rural areas are often in states with considerably lower population density--Iowa, Kansas, Nebraska, Texas, Oregon, and West Virginia. Similarly, the statewide areas include many very rural states. This group includes Arkansas, Montana, New Hampshire, Vermont, North and South Dakota, Utah, Alaska, Nevada, New Mexico, Idaho, and Wyoming.

The regional variables indicate that the east, south, and west all had prices that were higher than those found in the north central region. In addition, the south had higher levels of volume and intensity than the north central region, leading to 16 percent higher expenditures in the south. The expenditure differential was even greater in the west. Largely as a result of its higher prices and not volume and intensity, expenditures in the west were 22 percent above the north central area. Despite its higher prices, overall expenditures in the east were not significantly greater than those found in the control group.

Tables 8, 9, and 10 summarize the results of the regression analysis disaggregated by type of service. Coefficient estimates are provided only in those instances were the differential was estimated to be significant at the 90 percent confidence level or higher. The results are presented as percentage differences between each area and the relevant excluded area. That is, the type of

Table 8

Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity
Summary of Results, Evaluation and Management Services, 1988

	Office Visits	Hospital Visits	Emergency Room Services	Home & Nursing Home Visits	Specialist Evaluation & Management	Consultations
Very Large Cities						
Allowed Charges	46.1%**	51.6%**	20.3%*	88.4%**	66.9%**	100.2%**
Price Index	17.0**	18.4**	--	23.4**	12.8**	15.5**
Volume/Intensity	24.0**	26.1**	--	54.1**	44.5**	72.7**
Large Adjacent Cities						
Allowed Charges	33.4**	28.8**	--	45.0**	45.4**	56.5**
Price Index	--	13.4**	--	15.1**	--	14.6**
Volume/Intensity	20.8**	--	--	26.4**	35.8**	34.2**
Large Non-Adj Cities						
Allowed Charges	--	--	--	15.0*	--	--
Price Index	--	6.4**	--	--	--	--
Volume/Intensity	--	--	--	--	--	--
Small Cities/Rural						
Allowed Charges	--	-16.7**	-16.4*	--	--	--
Price Index	-6.5*	--	--	--	--	--
Volume/Intensity	--	-12.2*	--	--	--	--
Rural						
Allowed Charges	--	--	--	--	--	--
Price Index	-8.7**	--	--	--	--	--
Volume/Intensity	--	--	--	--	--	--
Statewide						
Allowed Charges	-22.2**	-14.4*	-29.1**	-19.1**	-15.8*	-21.1*
Price Index	-11.7**	-9.3**	--	-9.4**	-10.2**	-8.7**
Volume/Intensity	-9.3*	--	-19.3**	--	--	--
East						
Allowed Charges	27.2**	--	-26.2**	41.9**	--	24.0*
Price Index	19.0**	8.0**	-21.1**	20.0**	--	6.1*
Volume/Intensity	10.0*	--	--	16.8**	--	22.3**
South						
Allowed Charges	18.1**	25.8**	--	-15.8**	25.6**	22.7**
Price Index	6.1**	11.0**	--	11.9**	9.1**	--
Volume/Intensity	12.4**	15.5**	--	-31.3**	14.5**	17.3**
West						
Allowed Charges	51.1**	--	--	--	--	33.2**
Price Index	30.8**	28.1**	26.0**	32.8**	14.9**	19.4**
Volume/Intensity	20.1**	-18.4**	--	-29.0**	--	--

Note: Results are reported as percentage differences between each area and the relevant excluded group. Excluded areas are small cities and the north central region. Only statistically significant results are reported. Results significant at the .05 level are indicated by two asterisks. Results significant at the .10 level are indicated by one asterisk.

Source: Urban Institute, Health Policy Center

Table 9

Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity Procedures, 1988

	Major Procedures			Ambulatory Procedures				
	General Procedures	Cardio-vascular Procedures	Orthopedic Procedures	General Procedures	Eye Procedures	Minor Procedures	Oncology Services	Endoscopy Procedures
Very Large Cities								
Allowed Charges	15.1%**	--	--	18.3%**	27.0%**	104.0%**	--	23.8%**
Price Index	18.1**	12.8%**	17.7%**	19.2**	19.0**	26.1**	-21.2%**	16.8**
Volume/Intensity	--	--	-19.8**	--	--	63.7**	20.0*	--
Large Adjacent Cities								
Allowed Charges	23.1**	18.6*	16.6*	38.5**	23.9**	59.0**	--	37.5**
Price Index	18.0**	14.4**	16.6**	17.1**	10.5**	13.4**	--	16.6**
Volume/Intensity	--	--	--	16.9*	--	39.2**	--	16.9*
Large Non-Adj Cities								
Allowed Charges	--	--	--	--	--	--	--	--
Price Index	--	--	--	--	4.7*	--	-22.0**	--
Volume/Intensity	--	--	--	--	--	--	--	--
Small Cities/Rural								
Allowed Charges	--	--	--	-19.7**	--	--	-30.5**	-14.7*
Price Index	-6.1*	--	--	-5.9*	--	--	-22.5**	--
Volume/Intensity	--	--	--	-14.4**	-12.6*	-20.9*	--	-14.3**
Rural								
Allowed Charges	--	--	--	--	--	--	--	--
Price Index	--	--	--	--	--	--	--	--
Volume/Intensity	--	--	--	--	--	--	--	--
Statewide								
Allowed Charges	-11.3**	-20.4**	-15.0**	-24.7**	-18.0**	--	-46.7**	--
Price Index	-8.9**	-10.8**	-7.5**	-7.8**	--	--	-33.0**	--
Volume/Intensity	--	-10.8*	--	-15.4**	-14.3**	--	-15.6*	--
East								
Allowed Charges	--	--	--	14.5**	--	--	--	--
Price Index	11.1**	8.1**	11.9**	12.5**	--	21.3**	-20.7**	11.0**
Volume/Intensity	--	--	-15.1**	--	--	--	--	--
South								
Allowed Charges	9.1**	12.6**	--	11.6*	20.5**	--	--	--
Price Index	6.0**	--	10.3**	4.5*	--	--	-18.7**	6.5**
Volume/Intensity	--	9.7*	-10.6**	--	20.2**	--	17.6**	--
West								
Allowed Charges	26.0**	35.5**	24.2**	38.4**	22.8**	22.5*	--	--
Price Index	18.5**	13.9**	18.7**	19.5**	9.6**	16.2**	--	10.5**
Volume/Intensity	7.5*	19.6**	--	18.0**	12.6**	--	--	--

Note: Results are reported as percentage differences between each area and the relevant excluded group. Excluded areas are small cities and the north central region. Only statistically significant results are reported. Results significant at the .05 level are indicated by two asterisks. Results significant at the .10 level are indicated by one asterisk.

Source: Urban Institute, Health Policy Center

jh.3900:3983-06 t9

Table 10

Variation Across Areas and Regions in Allowed Charges, Prices, and Volume/Intensity Imaging and Tests, 1988

	Imaging				Tests	
	Standard Imaging	Advanced Imaging	Sonography	Imaging/ Procedures	Laboratory Tests	Other Tests
Very Large Cities						
Allowed Charges	33.5%**	39.9%**	81.9%**	--	40.0%**	85.1%**
Price Index	10.7**	9.2**	23.0**	17.4%**	--	20.1**
Volume/Intensity	21.4**	26.2**	44.7**	--	35.0**	53.6**
Large Adjacent Cities						
Allowed Charges	18.1*	34.1**	27.1*	--	39.7**	40.3**
Price Index	8.5**	10.7**	15.0**	17.0**	--	12.9**
Volume/Intensity	--	21.1**	--	--	32.0**	22.8**
Large Non-Adj Cities						
Allowed Charges	--	--	--	--	--	--
Price Index	--	--	--	--	--	--
Volume/Intensity	--	--	--	--	--	--
Small Cities/Rural						
Allowed Charges	--	-16.7*	--	--	--	--
Price Index	--	--	--	--	--	--
Volume/Intensity	-12.1*	-16.5**	--	--	--	-14.7*
Rural						
Allowed Charges	--	--	--	--	--	--
Price Index	--	--	--	--	--	--
Volume/Intensity	--	--	--	--	--	--
Statewide						
Allowed Charges	-15.7**	-22.7**	-21.2*	-15.3*	-15.6*	-17.4*
Price Index	-7.0**	--	--	--	--	--
Volume/Intensity	--	-19.2**	-18.7**	-17.1**	--	-15.7**
East						
Allowed Charges	14.4**	--	--	-15.7*	--	21.4**
Price Index	18.5**	11.6**	--	18.8**	-6.8**	16.1**
Volume/Intensity	--	--	--	-32.0**	--	--
South						
Allowed Charges	19.0**	34.9**	30.4**	20.0**	14.4*	28.7**
Price Index	4.4*	11.5**	9.6**	10.8**	--	12.2**
Volume/Intensity	14.1**	24.9**	22.1**	--	12.4*	16.7**
West						
Allowed Charges	13.9**	27.2**	--	12.6*	17.4**	21.8**
Price Index	11.3**	11.8**	17.8**	15.3**	--	20.2**
Volume/Intensity	--	15.4**	--	--	18.2**	--

Note: Results are reported as percentage differences between each area and the relevant excluded group. Excluded areas are small cities and the north central region. Only statistically significant results are reported. Results significant at the .05 level are indicated by two asterisks. Results significant at the .10 level are indicated by one asterisk.

Source: Urban Institute, Health Policy Center

jh.3900:3983-06 t8

area results are relative to small cities and the regional results are relative to the north central region. We present an overview of the results, followed by a more detailed discussion of each of the broad categories of services.

The results indicate that very large and large adjacent cities have higher levels of expenditures for almost all types of services. In many cases, these differences are associated with higher levels of prices. However, very large and large adjacent cities also have higher levels of volume and intensity for most evaluation and management services, as well as for imaging and tests. They did not, however, in most cases have higher levels of volume and intensity for procedures, with the principal exception of minor procedures.

In small cities/rural and statewide areas, volume and intensity was lower when a significant difference was found. However, the differences were not consistent across types of services for these two categories of areas. In evaluation and management services, volume and intensity was lower in small cities/rural areas for hospital visits, but lower in statewide areas for office visits and ER services. Among major procedures, statewide areas had lower volume and intensity for cardiovascular procedures, while small cities/rural areas were not different from small cities. Beneficiaries in both of these areas received a lower volume and intensity of minor procedures, endoscopies, other tests, and advanced imaging. There were also lower levels of volume and intensity for standard imaging in small cities/rural and for sonography and imaging with a procedure in statewide areas.

The data also show that for most individual services, the south had higher levels of allowed charges per enrollee, prices, and volume and intensity. The major exception was for several types of procedures. The west had higher levels of expenditures for many individual types of services. In most cases, this is associated with higher price levels. However, the west did have higher levels of volume and intensity for several types of procedures as well as for advanced imaging and laboratory tests. Finally, the east in general did not have higher levels of volume and intensity than the north central region. It did, however, typically have higher price levels; thus, often expenditures for many types of Medicare allowed charges in the east were higher than for the north central region.

Evaluation and Management Services. Table 8 summarizes the results for evaluation and management services. Very large cities had higher levels of allowed charges per enrollee for all evaluation and management services, ranging from 20 percent higher for emergency room services to 100 percent higher for consultations. With the exception of emergency rooms, very large cities had significantly higher price levels and volume and intensity than small cities. Differences in volume and intensity ranged from 24 percent higher levels for office visits to 73 percent higher levels for consultations.

Similarly, large adjacent cities had higher levels of allowed charges per enrollee for evaluation and management services, ranging from 29 percent higher for hospital visits to 57 percent higher for consultations. For some services the differences were associated with higher price levels. For all services but hospital visits and emergency rooms, large adjacent cities had higher levels of volume and intensity. These ranged from 21 percent higher for office visits to 36 percent higher for specialist evaluation and management services.

The small cities/rural areas, on the other hand, had significantly lower levels of allowed charges for hospital visits and emergency room services. The former was associated almost completely with lower levels of volume and intensity. The small cities/rural areas did not have significantly lower levels of either prices or volume and intensity for emergency room services.

Large nonadjacent cities and rural areas rarely had significantly different levels of allowed charges, prices, or volume and intensity relative to small cities.

The statewide areas had lower levels of allowed charges for all evaluation and management services. These ranged from 14 percent lower levels of allowed charges for hospital visits to 29 percent lower levels of allowed charges for emergency room care. For all but emergency room services, statewide areas had lower price levels. Statewide areas had lower levels of volume and intensity for office visits (9%) and emergency room care (19%).

Relative to the north central region, the east had higher levels of allowed charges for office visits (27%), home and nursing home visits (42%), and consultations (24%). The east, however, had lower levels of allowed charges for emergency room care, almost completely associated with price differences. For other services, some of the difference in allowed charges was associated with higher levels of prices. However, the east did have significantly higher levels of volume and intensity for office visits (10%), home and nursing home visits (17%), and consultations (22%).

The south had higher levels of allowed charges for office visits, hospital visits, specialist evaluation and management services, and consultations. The south had higher prices for most of these services. But the bulk of the difference was due to volume and intensity, where the south had higher levels for office visits (12%), hospital visits (16%), specialist evaluation and management services (15%), and consultations (17%).

The west had higher levels of prices for all six evaluation and management services relative to the north central region. Its lower levels of volume and intensity for hospital visits and home and nursing home visits offset the higher price levels. Only for office visits did the west have higher levels of volume and intensity (20%) than the north central region.

Procedures. Table 9 presents the detailed results for procedures. With the exception of minor procedures, the type of area and regional variables did not explain much of the difference in volume and intensity. This suggests that utilization of procedures is more evenly distributed across geographic areas than are evaluation and management services and, as will be shown below, imaging and tests.

Very large cities had higher levels of allowed charges for major general procedures, ambulatory general procedures, ambulatory eye procedures, minor procedures, and endoscopies. However, most of these differences are due to higher price levels. Very large cities did not have higher levels of volume and intensity for major general procedures or major cardiovascular procedures and actually had significantly lower levels of volume and intensity for major orthopedic procedures. Very large cities did have significantly higher levels of volume and intensity for minor procedures (64%) and oncology (24%).

Similarly, large adjacent cities had higher levels of expenditures for all types of procedures except oncology. Allowed charges for procedures varied from 17 percent higher for orthopedic procedures to 59 percent higher for minor procedures relative to small cities. Large adjacent cities had higher levels of prices for all seven of these types of procedures. However, only for three types of procedures did large adjacent cities have higher levels of volume and intensity--ambulatory general procedures, minor procedures, and endoscopies.

As with other services, large nonadjacent cities and rural areas did not have significantly different levels of allowed charges or volume and intensity than did small cities. Small cities/rural and statewide areas had lower levels of spending and volume and intensity for some services. Small cities/rural had lower price levels for some procedures and had lower levels of volume and intensity for ambulatory general procedures (14%), minor procedures (21%), and endoscopies (14%).

Statewide areas had lower levels of allowed charges for six of the eight types of procedures, ranging from 11 percent to 47 percent below those in small cities. For all six services, statewide areas had lower price levels, which explain much of the lower allowed charges. However, in statewide areas, volume and intensity for major cardiovascular procedures, ambulatory general procedures, and oncology. Volume and intensity was 11 percent lower for major cardiovascular procedures, 15 percent lower for ambulatory general procedures, and 16 percent lower for oncology.

The regional variables showed some interesting patterns as well. The east had higher levels of allowed charges only for ambulatory general procedures. However, the east had higher price levels for six of the eight types of procedures. The south had higher allowed charges per enrollee for four of the eight types of procedures, but only had higher volume/intensity for ambulatory procedures (20%). The greatest differences were in allowed charges per enrollee seen in the west. For seven out of the eight groups of procedures, the west had higher price levels. However, for five of the eight groups, the west also had higher levels of volume and intensity. Relative to the north central region, the west had higher levels of volume and intensity for major general procedures (7%), major cardiovascular procedures (20%), ambulatory general procedures (18%), ambulatory eye procedures (13%), and oncology services (18%).

Imaging and Tests. Table 10 presents the detailed results for imaging and tests. Unlike procedures, the results suggest substantial differences across areas. Very large cities had higher levels of allowed charges for each of the imaging groups and tests, with the exception of imaging/procedures. Allowed charges per enrollee ranged from 34 to 85 percent higher than in small cities. With the exception of laboratory tests, very large cities had higher price levels than did small cities. In addition, very large cities had significantly higher levels of volume and intensity for all imaging services and tests, with the exception of imaging/procedures. The differences in each case were statistically significant and substantial in magnitude, ranging from 21 percent higher for standard imaging to 54 percent higher for other tests.

A similar pattern was shown for large adjacent cities. Here allowed charges per enrollee ranged from 18 percent to 40 percent higher than in small cities. Again, the exception was imaging/procedures. As with very large cities, large adjacent cities had higher price levels, with the exception of laboratory tests. Large adjacent cities had higher levels of volume and intensity for advanced imaging (21%), laboratory tests (32%), and other tests (23%).

As with other types of services, large nonadjacent cities and rural areas did not have statistically significant differences relative to small cities. Small cities/rural areas had lower levels of volume and intensity for standard imaging, advanced imaging, and other tests, but did not have lower levels of allowed charges.

In contrast, statewide areas had lower levels of allowed charges per enrollee for all six categories of services. These ranged from 15 percent lower for imaging procedures to 23 percent lower for advanced imaging. Differences in standard imaging and laboratory tests were associated with lower price levels. In other cases, statewide areas had lower levels of volume and intensity. Statewide areas had 19 percent lower levels of volume and intensity for advanced imaging and sonography, 17 percent lower for imaging procedures, and 16 percent lower for other tests.

The regional variables showed patterns similar to those for other types of services. The east had higher allowed charges per enrollee for standard imaging and other tests, but these were associated with higher price levels. The south had higher levels of allowed charges per enrollee for all types of imaging services and tests. For all but laboratory tests, this was associated with higher price levels. The south also had higher levels of volume and intensity for all types of services within this group, ranging from 12 percent higher for laboratory tests to 25 percent higher for advanced imaging. The west had higher levels of allowed charges for all types of services except sonography. In most cases this is associated with higher price levels. However, the west also had higher levels of volume and intensity for advanced imaging (15%) and laboratory tests (18%).

IV. CONCLUSIONS

This paper has explored cross-sectional variations across geographic areas in Medicare allowed charges per enrollee, prices, and volume and intensity per enrollee for 1988. The use of the Fisher's Ideal Price Index, that acknowledges variation in service mix across areas, has allowed us to develop better measures of volume and intensity variation than has been previously available. In addition, we applied the Berenson/Holahan service classification system to estimate variation in the volume and intensity for 20 different types of services.

The major conclusion of this paper is that there are substantial geographic differences in the volume and intensity of physician services provided to Medicare beneficiaries. Volume and intensity varies by a factor of 3.5 from highest to lowest and by 1.7 in the 95th to the 5th percentile. The degree of variation varies across service categories. There is substantially more variation for consultations, home and nursing home visits, minor procedures, oncology services, and laboratory and other tests than there is for office visits, all categories of major procedures, endoscopies, and standard imaging. This was evident in the selected cities and rural areas that we highlighted.

The descriptive regression equations indicated that Medicare allowed charges per enrollee were substantially higher in very large and large-adjacent cities relative to small cities, and significantly lower in small cities/rural areas and statewide areas. The higher level of allowed charges in the very large and large-adjacent cities was associated with both higher prices and higher volume and intensity. Specifically, very large and large-adjacent cities had higher levels of volume and intensity for evaluation and management (E&M) services, imaging, and tests, but not, in most cases, for procedures (with the principal exception of minor procedures). The lower levels of allowed charges in the more rural areas was generally associated with lower levels of volume and intensity, but sometimes by lower prices as well. These lower levels of volume and intensity were associated with several evaluation and management services, some types of imaging, and tests, but, again, not procedures. The regional results show that the south had higher levels of volume and intensity than other regions, resulting in higher levels of allowed charges. Allowed charges were also higher in the west, but principally due to higher prices and not due to volume and intensity.

These findings have implications for the implementation of subnational volume performance standard policy. It suggests that a uniform national volume performance standard will be treating areas with very high levels of utilization no differently than areas with low levels of utilization. If volume performance standards are to be implemented at a subnational level, targets that vary inversely with current levels of utilization could be considered. Clearly, there needs to be greater understanding of the reasons for geographic variations before such differentials should be adopted. We need to explore the contribution of age and health status differentials, as well as the role of other factors in explaining utilization differentials. However, because the variation in most determinants of utilization at the area level is small relative to the utilization differences that we have observed, we strongly suspect that utilization differentials will remain substantial after various factors are accounted for. Thus, it is not premature to begin planning for the eventual implementation of a volume performance standard policy that permits base *levels* of utilization to be a factor in the determination of rate of growth targets as well as the rate of growth in V/I that is currently being captured.

REFERENCES

Berenson, Robert and John Holahan. 1990. "Using a New Type-of-Service Classification System to Examine the Growth in Medicare Physician Expenditures, 1985-1988." Urban Institute Working Paper no. 3983-01. December.

Chassin, Mark R., Jacqueline Kosecoff, R.E. Park, Constance M. Winslow, Katherine C. Kahn, Nancy J. Merrick, Joan Keesey, Arlene Fink, David H. Soloman and Robert H. Brook. 1987. "Does Inappropriate Use Explain Geographic Variations in the Use of Health Care Services?" Journal of the American Medical Association 258 (18): 2533-2537.

Escarce, Josè J. 1990. "Effects of the Relative Fee Structure on the Use of Surgical Operations under Medicare." Paper presented at American Medical Association Workshop on Behavioral Responses to the Implementation of the New Medicare Physician Payment Schedule. November 15. Arlington, Virginia.

Holahan, John, Robert A. Berenson, and Peter G. Kachavos. 1990. "Area Variations in Selected Medicare Procedures." Health Affairs 9 (4) Winter.

Holahan, John and Stephen Zuckerman. 1991. "Measuring Prices of Medicare Physician Services." Urban Institute Working Paper no. 3983-04. July.

McPherson, Klim, John E. Wennberg, Ole B. Hovind, and Peter Clifford. 1982. "Small-Area Variations in the Use of Common Surgical Procedures: An International Comparison of New England, England, and Norway." The New England Journal of Medicine 307 (21): 1310-1313.

Moore, Francis D. 1985. "Small Area Variations Studies: Illuminating or Misleading?" Health Affairs 4 (1): 96-101.

Roos, Noralou P. and Leslie L. Roos. 1982. "Surgical Rate Variations: Do They Reflect the Health or Socioeconomic Characteristics of the Population?" Medical Care 20 (9): 943-958.

Stano, Miron. 1986. "A Further Analysis of the "Variations in Practice Style" Phenomenon." Inquiry 23 (Summer): 176-182.

Wennberg, J. and A. Gittelsohn. 1982. "Variations in Medical Care Among Small Areas." Scientific American 246: 120-133.

Zuckerman, Stephen and John Holahan. 1991. "Geographic Border Crossing: Implications for Volume Performance Standards." Urban Institute Working Paper no. 3983-03. September.

APPENDIX A

Geographic Differentials in Price for Medicare Physician Services, by Area and Area Type, 1988

APPENDIX A

Geographic Differentials in Price for Medicare Physician Services, by Area and Area Type, 1988

Medicare Carrier	Area Name	Area-Level Fisher's Ideal Index
VERY LARGE CITIES		
00542	San Francisco/San Mateo/Marin, CA	1.164
00580	DC and MD/VA Suburbs (Area Wide)	1.149
00590	Miami, FL	1.319
00621	Chicago, IL	1.086
00700	Urban Massachusetts	1.094
00710	Detroit, MI	1.029
00803	New York City Metro	1.303
00865	Large Cities Pennsylvania	1.067
00900	Houston, TX	1.096
02050	Los Angeles, CA	1.332
LARGE CITIES - ADJACENT		
00542	Oakland/Berkeley, CA	1.158
00542	San Bernadino/Riverside, CA	1.224
00590	Fort Lauderdale, FL	1.166
00621	East St. Louis, IL	0.916
00803	Poughkpsie/N NYC Suburbs	1.107
02050	Ventura, CA	1.295
02050	Anaheim/Santa Ana, CA	1.264
LARGE CITIES - NONADJACENT		
00510	Birmingham, AL	0.965
00528	New Orleans, LA	1.041
00542	Sacramento, CA	1.128
00542	Santa Clara/Monterey, CA	1.157
00590	N/NC Florida Cities	1.038
00630	Metropolitan Indiana	0.925
00690	Baltimore, MD	1.102
00740	Kansas City (Area Wide)	0.946
00801	Buffalo, NY	0.973
00801	Rochester, NY	0.968
00900	San Antonio, TX	1.070
00900	Dallas, TX	1.090
00930	Seattle, WA	0.969

Medicare Carrier	Area Name	Area-Level Fisher's Ideal Index
LARGE CITIES - NONADJACENT (continued)		
00951	Milwaukee, WI	0.955
01030	Phoenix, AZ	1.085
01040	Atlanta, GA	0.971
01380	Portland, OR	0.962
02050	San Diego, CA	1.254
10230	Hartford, CT	1.023
10230	New Haven, CT	1.078
10240	St. Paul/Minneapolis, MN	0.915
10490	Tidewater, VA	0.941
11260	St. Louis, MO	0.909
16360	Akron/Youngstown, OH	0.999
16360	Cincinnati, OH	0.974
16360	Cleveland, OH	1.075
16360	Columbus, OH	1.003
16360	Dayton/Springfield, OH	0.974
SMALL CITIES		
00510	Small Cities Alabama	0.908
00510	Mobile, AL	0.881
00528	Small Cities Louisiana	0.961
00542	Stockton, CA	1.150
00542	Merced, CA	1.400
00542	Fresno, CA	1.132
00542	Monterey, CA	1.124
00542	Bakersfield, CA	1.209
00621	Small Cities Illinois	0.909
00630	Small Cities Indiana	0.864
00640	Iowa City, IA	0.917
00655	Omaha, NB	0.961
00660	Lexington/Louisville, KY	0.932
00801	N Central Cities New York	0.959
00865	Small Cities Pennsylvania	0.998
00900	Fort Worth, TX	1.011
01030	Tucson, AZ	1.040
01040	Small Cities Georgia	0.950
01370	Oklahoma City, OK	0.933
01370	Tulsa, OK	0.935
02050	Santa Barbara, CA	1.272
10120	Stamford, CT	1.118
10490	Richmond, VA	0.929
16510	Charleston, WV	1.026

Medicare Carrier	Area Name	Area-Level Fisher's Ideal Index
SMALL CITIES/RURAL		
00640	Small Cities/Rural Iowa	0.873
00650	Small Cities/Rural Kansas	0.959
00655	Small Cities/Rural Nebraska	0.862
00660	Small Cities/Rural Kentucky	0.909
00690	Small Cities/Rural Maryland	1.006
00700	Small Cities/Rural Massachusetts	1.069
00710	Small Cities/Rural Michigan	0.938
00720	Small Cities/Rural Minnesota	0.863
00900	Northeast Texas	1.008
00900	Southeast Texas	1.040
00900	Western Texas	0.987
00930	Small Cities/Rural Washington	0.979
00951	Small Cities/Rural Wisconsin	0.863
01380	Small Cities/Rural Oregon	0.951
10230	Small Cities/Rural Connecticut	1.012
10490	Small Cities/Rural Virginia	0.860
11260	Small Cities/Rural Missouri	0.885
16360	Small Cities/Rural Ohio	0.967
16510	Small Cities/Rural West Virginia	0.968
RURAL		
00510	Rural Alabama	0.889
00528	Rural Louisiana	0.935
00542	Northern Rural California	1.113
00590	Rural Florida	1.023
00621	Rural Illinois	0.910
00630	Rural Indiana	0.868
00801	Rural New York	0.948
00865	Rural Pennsylvania	0.973
01030	Rural Arizona	1.068
01040	Rural Georgia	0.903
01370	Rural Oklahoma	0.898
STATEWIDE		
00520	Arkansas	0.924
00550	Colorado	0.830
00570	Delaware	0.998
00751	Montana	0.911
00780	New Hampshire	0.920
00780	Vermont	0.936
00820	North Dakota	0.933
00820	South Dakota	0.876

Medicare Carrier	Area Name	Area-Level Fisher's Ideal Index
STATEWIDE (continued)		
00860	New Jersey	1.052
00870	Rhode Island	1.015
00880	South Carolina	0.853
00910	Utah	0.852
01020	Alaska	1.263
01120	Hawaii	1.187
01290	Nevada	1.242
01360	New Mexico	1.011
05130	Idaho	0.870
05440	Tennessee	0.880
05530	Wyoming	0.873
05535	North Carolina	0.880
10250	Mississippi	0.824
21200	Maine	0.906

CMS LIBRARY
3 8095 00012779 1